Agreement of quantitative and qualitative antimicrobial susceptibility testing methodologies: The case of enrofloxacin and avian pathogenic *Escherichia coli*

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Abstract

Objectives: Avian pathogenic *Escherichia coli* (APEC) is the causal agent of colibacillosis, one of the most common bacterial infections in the poultry sector. Antimicrobial susceptibility testing (AST) is essential for rational and prudent antimicrobial therapy. Subsequently, uniformity in test results from the various testing methodologies used in diagnostic laboratories is pivotal. The aim of this study was therefore to evaluate the agreement between different antimicrobial susceptibility testing methods in determining fluoroquinolone resistance in APEC.

Materials and Methods: Twenty APEC isolates were selected and subjected to four different susceptibility tests: the quantitative microbroth dilution, agar dilution and gradient strip tests and the qualitative disk diffusion method. The experiments were performed in triplicate. Categorical agreement, essential agreement and different errors were assessed. Moreover, agreement was also evaluated by calculating intraclass correlation coefficients (ICCs) for the quantitative tests and determining the Pearson correlation coefficients for the agreement between the disk diffusion method and the quantitative tests.

Results: Categorical agreement and essential agreement when compared with the microbroth technique ranged from 85-95% and 85-100%, respectively. No very major errors (false susceptible) and only one major error (false resistant) and minor errors (results involving an intermediary category) were detected. The calculated ICC values of the three quantitative tests fluctuated around 0.970 (range 0.940 to 0.988). There was a high negative correlation between the disk diffusion method and the other tests (correlation coefficients ranging from -0.979 to -0.940), indicating a clear inverse relationship between the MIC value and the zone diameter of growth inhibition.

Conclusion: In conclusion, the overall agreement between the four different testing methodologies was very high. These results confirm the reliability of the disk diffusion and gradient strip test methods as substantiated alternatives, next to the gold standard agar and microbroth dilution, for fluoroquinolone susceptibility testing of APEC isolates.